Preface: Special issue on Foundations of Coordination Languages and Software Architectures (selected papers from FOCLASA'09)

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This issue contains extended versions of selected papers from the 8^{th} International Workshop on the Foundations of Coordination Languages and Software Architectures (FOCLASA'09).

A number of hot research topics are currently sharing the common problem of combining concurrent, distributed, mobile and heterogenous components, trying to harness the intrinsic complexity of the resulting systems. Coordination languages and software architectures are recognised as fundamental approaches to tackle these issues, improving software productivity, enhancing maintainability, advocating modularity, promoting reusability, and leading to systems more tractable and more amenable to verification and global analysis.

The objective of the FOCLASA workshops (`http://foclasa.lcc.uma.es`) is to bring together researchers and practitioners of the aforementioned fields, in order to share and identify common problems, and to devise general solutions in the contexts of coordination languages and software architectures. FOCLASA'09 was held in Rhodes (Greece) on July 11th, 2009.

From the ten research works that were presented at FOCLASA'09, an initial selection of papers was made by the Program Committee, and their authors were invited to submit an extended version to this special issue. These extended papers went through an anonymous peer review process, and the revised versions of the five papers finally accepted are included in this special issue. We believe that the papers presented here provide key insights on different aspects of coordination languages and software architectures.

The first article in this special issue, *"SAT-based Verification for Timed Component Connectors"*, by Stephanie Kemper, presents a SAT-based approach for bounded model checking of Timed Constraint Automata, which permits true concurrency in the timed orchestration of components. She presents an embedding of bounded model checking into propositional logic with linear arithmetic. She defines a product that is linear in the size of the system, and in this way overcomes the state explosion problem to deal with larger systems. To further improve model checking performance, she shows how to embed her approach into an extension of counterexample guided abstraction refinement with Craig interpolants.

The second article, *"Connectors as Designs: Modelling, Refinement and Test Case Generation"*, by Sun Meng *et al.*, uses Unifying Theories of Programming (UTP) to formalize Reo connectors, whereby connectors are interpreted as designs in UTP. This model can be used as a semantic foundation for proving properties of connectors, such as equivalence and refinement relations between connectors. Furthermore, it can be used as a reference document for developing tool support for Reo, such as test case generators. A fault-based method to generate test cases for component connectors from specifications is also provided in this article. The authors finally give test cases and connectors a unifying formal semantics by using the notion of design in UTP, and generate test cases by solving constraints obtained from a specification and a faulty implementation.

The third article, *"ASPfun: A Typed Functional Active Object Calculus"*, by Ludovic Henrio *et al.*, defines ASPfun, a calculus of functional objects, behaving autonomously and communicating by a request-reply mechanism, where requests are method calls handled asynchronously and futures represent awaited results for requests. This results in an object language enabling a concise representation of a set of active objects interacting by asynchronous method invocations. This article first presents the ASPfun calculus and its semantics. Then, it provides a type system for ASPfun which guarantees the "progress" property. Most importantly, ASPfun has been formalised; its properties have been formalised and proved using the Isabelle theorem prover. This work also studies different binder representations and presents experiments with two of them in the Isabelle/HOL theorem prover.

The fourth article, *"Symbolic Execution of Reo Circuits using Constraint Automata"*, by Bahman Pourvatan *et al.*, proposes a technique for symbolic execution of Reo circuits using the symbolic representation of data constraints in Constraint Automata. By using this technique the authors obtain the relations among the data that pass through the circuit and infer the coordination patterns of the circuit. They also use the technique to find deadlocks which may involve data values. They use regular expressions and their derivatives which are obtained from Constraint Automata and show that there is an upper bound of one for unfolding the cycles in Constraint Automata which is enough to reveal the relations between symbolic representations of inputs and outputs.

Finally, the last article, *"A Generic Framework for N-Protocol Compatibility Checking"*, by Francisco Durán *et al.*, focuses on the development of new systems from existing services which are usually accessed through their public interfaces. In this context, interfaces must be compatible in order to avoid interoperability issues. They present a new framework for checking the compatibility of n service interfaces. Their framework is generic, in the sense that it implements several compatibility notions useful for different application areas, and extensible since new further notions can easily be incorporated. They consider a service interface model which takes behavioural descriptions with value-passing and non-observable actions into account. Their compatibility checking framework has been fully implemented into a prototype tool which relies on the rewriting logic-based system Maude.

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